

Application No: 10/520,232
Amendment A
Reply to Office Action Dated 07/26/2007

Attorney Docket No: 3926.127

IN THE CLAIMS:

The following listing of claims replaces any earlier listing:

1-28. (Cancelled).

29. (New) A method for cleaning a three dimensional surface (12, 52) of a component (10) using a cleaning device (14),

the device comprising:

a three-dimensional cleaning head (18) including at least one stop shoulder (50),

a positioning device (16) for moving the cleaning device (14), the positioning

device having a coarse positioning system (20) and a fine positioning system (22),

and the method comprising:

moving the cleaning head (18) in a force-controlled manner by means of the coarse and fine positioning system (22) in at least one direction of movement selected from a plurality of possible directions of movement (24, 26, 28, 30, 32, 34) for forming contact pressure of the cleaning head (18) on at least one surface (12) of the component (10) being cleaned, the possible directions of movement (24, 26, 28, 30, 32, 34) including directions of linear movement (24, 26, 28) along axes substantially orthogonal to one another and directions of rotation (30, 32, 34) about the axes,

moving the at least one stop shoulder (50) with its cleaning stop surface (44) frontally against an edge surface (52) of the component (10) while forming contact pressure, the cleaning head (18) being moved along at least one direction of linear movement (24, 26, 28) by means of the fine positioning system (22) within a predetermined tolerance range,

wherein the fine positioning system (22) has for the directions of linear movement (24, 26, 28) of the cleaning head (18) a respectively assigned fine positioning element (38, 40, 42) for predetermining the contact pressure specific to the direction of

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movement, movements of the cleaning head (18) in the directions of rotation (30, 32, 34) are controlled by the coarse positioning system (20).

30. (New) The method according to claim 29, wherein the contact pressure by means of the fine positioning system (22) is limited with regard to its maximum value.
31. (New) The method according to claim 29, wherein the movement of the cleaning head (18) in contiguous contact with the component (10) takes place by means of the fine positioning system (22) alone or by means of simultaneous actuation of the coarse positioning system (20) and the fine positioning system (22).
32. (New) The method according to claim 29, wherein to optimize cleaning, the contact pressure can be variably set.
33. (New) The method according to claim 29, wherein the contact pressure is predetermined in dependence on at least one of an active contact surface of the cleaning head (18) of varying size and a parameter of the component.
34. (New) The method according to claim 29, wherein changing of the contact pressure at the fine positioning system (22) takes place in an automated or manual manner at least one of before and during cleaning operation.
35. (New) The method according to claim 29, wherein the cleaning head (18) is moved manually by means of a manipulator as the positioning device (16) or in an automated manner by means of a robot (36) as the positioning device (16).
36. (New) A cleaning device, in particular for implementing the method as claimed in Claim 29, the cleaning device (14) serving for cleaning at least one surface (12) of a component (10), the cleaning device comprising:

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a three-dimensional cleaning head (18) including at least one stop shoulder (50),
a positioning device (16) for moving the cleaning device (14), the positioning
device having a coarse positioning system (20) and a fine positioning system (22),
wherein the movement of the cleaning head (18) is force-controlled by means of
the fine positioning system (22) at least in one direction of movement selected from a
plurality of possible directions of movement (24, 26, 28, 30, 32, 34), the possible
directions of movement (24, 26, 28, 30, 32, 34) including directions of linear movement
(24, 26, 28) along axes substantially orthogonal to one another and directions of rotation
(30, 32, 34) about the axes,

wherein the cleaning head (18) has a three-dimensionally extending cleaning
surface (48) and at least one stop shoulder (50), which can be moved with its cleaning
stop surface (44) frontally against a component edge (52), while forming contact
pressure, the cleaning head (18) being displaceable by means of the fine positioning
system (22) along at least one direction of movement (24, 26, 28) within a
predeterminable tolerance range,

wherein the fine positioning system (22) has for the directions of linear movement
(24, 26, 28) of the cleaning head (18) a respectively assigned fine positioning element
(38, 40, 42) for predetermining the contact pressure specific to the direction of
movement, movements of the cleaning head (18) in the directions of rotation (30, 32, 34)
are controlled by the coarse positioning system (20).

37. (New) The cleaning device according to Claim 36, wherein the fine positioning system
(22) is formed as a functional unit with limited maximum force.
38. (New) The cleaning device according to Claim 36, wherein the tolerance range is defined
by at least one of maximum adjusting displacement of the fine positioning system (22) and
geometry of the cleaning head (18).

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39. (New) The cleaning device according to Claim 36, wherein the fine positioning element (38, 40, 42) has a telescopic adjusting mechanism.
40. (New) The cleaning device according to Claim 36, wherein the fine positioning element (38, 40, 42) can be variably set with regard to its maximum adjusting force, while forming the contact pressure.
41. (New) The cleaning device according to Claim 36, wherein the fine positioning element (38, 40, 42) has a pneumatic or hydraulic actuating unit.
42. (New) The cleaning device according to Claim 36, wherein the cleaning head (18) has for at least one direction of movement (24, 26, 28) that is relevant to component contact a cleaning stop surface (44) with an associated fine positioning element (42).
43. (New) The cleaning device according to Claim 36, wherein the cleaning head (18) is exchangeably fastened to the fine positioning system (22).
44. (New) The cleaning device according to Claim 36, wherein it is formed as a manipulator device or as a robot (36).
45. (New) The cleaning device according to Claim 36, wherein the coarse positioning device (20) has a movable robot arm (46), fastened to a free end of which is the fine positioning system (22), which carries the cleaning head (18).
46. (New) The cleaning device according to Claim 44, wherein it has a programmable open-loop and/or closed-loop control device for the at least partially automated positioning of the cleaning head (18) and cleaning of the component (10).

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47. (New) The cleaning device according to Claim 36, wherein the cleaning surface (48) is formed in a substantially U-shaped or L-shaped manner.
48. (New) The cleaning device according to Claim 36, wherein the cleaning surface (48) has at least one undercut (54), which can be brought into contiguous contact with a component surface (12).
49. (New) The cleaning device according to Claim 36, wherein the cleaning head (18) is provided on its component contact side with at least one exchangeable cleaning element (56).
50. (New) The cleaning device according to Claim 49, wherein the cleaning element (56) is at least of a sponge, a brush element and a cloth, and in particular a microfiber cloth.
51. (New) The cleaning device according to Claim 36, wherein it has a store for the intermediate storage of at least one of at least one cleaning head (18) and at least one cleaning element (56).
52. (New) The cleaning device according to Claim 36, wherein it has a handling device for handling at least one of a cleaning-head and a cleaning-element.
53. (New) The cleaning device according to Claim 36, wherein the component (10) is a component of a vehicle body with at least one surface (12) to be cleaned in a defined manner with regard to the contact pressure to be applied.